

Application of an Abandoned Jacket for an Offshore Structure Base of Wind Turbine in Bohai Heavy Ice Conditions

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ABSTRACT

The abandoned SZ36-1 SPM Jacket is reused as the structure base for wind turbine. SZ36-1 is located in Liaodong Bay, 50km west to Suizhong County, 74km northern to JZ20-2 Gas Field, and 102km away to Qinghuangdao. Ice is the control environmental loads to the jacket base and the tower of wind turbine.

The tower of wind turbine designed for land use is applied to the SZ36-1 SPM Jacket, and the load cases have been changed a lot. Assessment has to be performed for the tower of wind turbine, especially for the fatigue damage under the combination effect of wind, ice, and wave.

The model has been developed and analyzed by utilizing the ABAQUS finite element analysis software. The ultimate strength analysis, earthquake analysis, fatigue assessment and buckling strength calculation are performed and the results show that the tower structure meets the minimum requirements for yielding, fatigue and buckling criteria during the service period of 20 years.

KEY WORDS: Wind Energy; Offshore Structure base; Jacket; Heave ice condition.

INTRODUCTION

At the present time, steel jacket offshore platforms are widely employed in offshore petroleum activities throughout the offshore areas of the world. In China, there are about 200 jacket platforms are in charge of The China National Offshore Oil Corporation (CNOOC), most of them are built in eighties last century. As the design life of these platforms are about only 20 years, they are needed to being demolished or reused.

CNOOC takes the first attempt to application of an abandoned jacket (Fig. 1) for an offshore structure base of wind turbine. The abandoned SZ36-1 SPM Jacket is located in SZ36-1 oil field. SZ36-1 oil field was found in 1987, it's the first big oil field found in Bohai Gulf which has more than one billion tons of oil reserves. Water depth of the field is 30 m ~ 31 m. Ice and earthquake are the control environmental loads.

During 2007, a prototype of the GLODWIND power 1.5 MW wind turbine (Fig. 2) has been selected for the demonstrator project to investigate the feasibility for using OWT on a jacket foundation to supply the electricity of offshore oil field.



Fig. 1 The abandoned SZ36-1 SPM jacket



Fig. 2 The demonstrator project of wind turbine

In this paper we reviewed the challenges they faced, this include:

- Design of the jacket cap between jacket and tower